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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/677,941

10/01/2003

Jae-Hyuk Eoh

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08/26/2005

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EXAMINER

PALABRICA, RICARDO J

ART UNIT

PAPER NUMBER

3663

DATE MAILED: 08/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/677,941

Applicant(s)

EOH ET AL.

Examiner

Rick Palabrica

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) 6-8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 6-8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10/1/03 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/1/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's election with traverse of Group I (claims 1-5) in the reply filed on 6/9/05 is acknowledged. This election is in response to a 5/4/05 Office action issued by a previous Examiner.

The traversal pertains to the species election requirement and not to the restriction between the two groups of invention. The traversal is on the ground(s) that the species shown in Figs. 3, 4, 5 and 7 all illustrate the same heat removal system. The current Examiner agrees with the Applicant.

Accordingly, the election requirement with respect to species is withdrawn. However, the election with respect to the groups of invention is still deemed proper and is therefore made FINAL.

Specification

2. The abstract of the disclosure is objected to because the abstract should not exceed 150 words in length. Correction is required. See MPEP § 608.01(b).

Drawings

3. Figures 9 and 10 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct

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any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 2 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 2 recites the limitation, "the outer circumference of the reactor vessel is also cooled with external air by using a passive vessel cooling system." There is neither an adequate description nor enabling disclosure of the so-called "passive vessel cooling system" and the manner that this system handles the alleged external air to cool the vessel.

5. Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitations "the position", "the normal steady-state conditions", "the sodium" and "the core decay heat" in lines 12, 13 and 14, 19 and 24, respectively. There are insufficient antecedent bases for these limitations in the claim.

Claim 2 is vague, indefinite and incomplete, and its metes and bounds cannot be determined, particularly in regard to the term/phrase "passive vessel cooling system." It is not known what all is meant by or encompassed by this term/phrase. There is also no criterion for determining the reference for "external air", e.g., external to what- the fuel, the steam generator, the containment?

Claim 5 is vague, indefinite and misdescriptive, and its metes and bounds cannot be determined. The claim recites quantitatively controlling heat transfer by "manipulating surface emissivity of the sodium-sodium heat exchanger". The term, "manipulate" means to operate with the hands (see Webster's dictionary, p.708). Emissivity is a built-in characteristic of a material and it cannot be "manipulated", e.g., by turning a handle or pulling like a control rod.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by any one of Hundal et al. (U.S. 4,780,270)

Hundal et al. disclose a method for passive removal of shutdown heat of a liquid metal reactor (see Abstract and Figs. 1-3).

As to claim 1, Applicant's claim language reads on Hundal et al.'s invention as follows (e.g., see Fig. 3A: a) "hot pool" reads on hot plenum 41 defined above core 30 and inside a baffle 94; b) "cold pool" reads on the cold plenum 40 (see col. 9, lines 62+); c) "sodium-sodium heat exchanger" reads on shutdown heat exchanger 120 (see col. 9, lines 35+); d) "sodium-air heat exchanger" reads on stack 79.2 and flue 79 (see Fig. 2B and col. 9, lines 45+).

As to claim 2, absent a definition of the term/phrases "external air" and "passive vessel cooling system", Applicant's claim language reads on the air inherently cooling the outer surface of the reactor cavity structure 9 (see Fig. 1).

As to claim 3, Hundal et al. disclose an embodiment of the shutdown heat removal system shown in Fig. 3A. Applicant's claim language "circular vertical tube" reads on either one of vertical manifolds 126a of 126b of the heat exchanger 120 (see col. 9, lines 44+). This vertical tube becomes immersed in the hot pool when the primary pump stops. Heat exchanger 120 can be arranged such that its coil is not in contact with the cold sodium during normal operations (see col. 8, lines 53+).

As to claim 5, this limitation is inherently met by Hundal et al. because their sodium in the heat-removing loop does not solidify.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Sharbaugh (U.S. 4,762,667) or Schenewerk (U.S. 4,367,194) or Jogand (U.S. 4,115,192) in view of Hundal et al. Applicant's claims are disclosed by any one of Sharbaugh or Schenewerk or Jogand, except for the sodium-air heat exchanger.

Sharbaugh teaches a method for passive decay heat removal for a liquid metal reactor (see Fig. and Abstract).

Applicant's claim language reads on Sharbaugh's invention as follows: a) "hot pool" reads on hot outlet plenum pool 4 located above the core 1 and inside reactor baffle 16; b) "cold pool" reads on radial flow plenum 8 between reactor baffle 16 and inner wall 12 of the reactor vessel; c) "sodium-sodium heat exchanger" reads on heat exchanger 5 that is positioned at a higher level than the cold pool 8; d) "reactor vessel" reads on concrete containment structure (not numbered).

As to the limitation in claim 1 regarding natural circulation between the hot pool and the cold pool, Sharbaugh discloses that his system performs internal, natural circulation when the power is lost to the reactor causes a scram and stoppage of the

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primary pumps (see col. 2, lines 38+). Note that there is inherently overflow sodium from hot pool 41 to cold pool 8 during this natural circulation process.

As to the limitation in claim 2, the outer surface of the containment structure of Sharbaugh is inherently cooled by external air, and such cooling is a passive system because no active components (e.g. pumps) are necessary to achieve the desired end result.

Schenewerk teaches an emergency core cooling system and method for cooling a liquid metal reactor (see Figs. 1-4 and Abstract). Applicant's claim language reads on Schenewerk's invention as follows: a) "hot pool" reads on upper zone 22 (see col. 5, lines 56+; b) "cold pool" reads on either on of plena 36, 38 (see col. 5, lines 1+); c) "sodium-sodium heat exchanger" reads on decay heat removal heat exchanger 56 (see col. 5, lines 15+); d) "reactor vessel" reads on concrete containment structure 16.

Jogand teaches a method for removing residual heat from a liquid metal reactor (see Figs. 1 and 2 and Abstract). Applicant's claim language reads on Jogand's invention as follows: a) "hot pool" reads on hot sodium in vessel 15 (see col. 3, lines 38+; b) "cold pool" reads on either on cold sodium in volume space 26 between vessels 4 and 15 (see col. 3, lines 39+); c) "sodium-sodium heat exchanger" reads on auxiliary heat exchanger 35 (see col. 4, lines 1+); d) "reactor vessel" reads on concrete containment structure.

Sharbaugh or Schenewerk or Jogand do not provide specifics for their ultimate heat sink. However, Hundal et al. teach the use of a sodium-air heat exchanger

(ultimate heat sink) that does not use flow-impairing louvers in draft flues to reduce plant construction costs (see col. 4, lines 50+).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus, as disclosed by Sharbaugh or Schenewerk or Jogand, by the teaching of Hundal et al., to include a sodium-air heat exchanger, to gain the advantages thereof (i.e., low cost ultimate heat sink), because such modification is no more than the use of a well known expedient within the nuclear art.

8. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over any one of Jogand (U.S. 4,115,192) in view of Hundal et al.

As to claim 3, Jogand teaches an embodiment of the auxiliary heat exchanger 35 in Fig. 2 that has vertical tubes (i.e., manifolds 59, 60).

As to claim 5, this limitation is inherently met by the combination because the sodium in their heat-removing loop does not solidify.

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable either one of Hundal et al. or the combination of Jogand and Hundal et al. These references have been discussed above.

As to the claim limitation of "manipulating" the surface emissivity of the sodium-sodium heat exchanger, this is a matter of optimization within prior art conditions or through routine experimentation (see MPEP 2144.05 II.A).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References D-G further illustrate prior art.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 571-272-6880. The examiner can normally be reached on 6:30-5:00, Mon-Thurs.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RJP
August 23, 2005

